IPM CRSP Working Paper 99-1
(June 1999)

Farmer Practices for Managing the Principal Potato Pests in the Province of Carchi, Ecuador: Results of a Baseline Survey and Participatory Appraisal

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Forward

In September 1993, the United States Agency for International development awarded a grant for the Integrated Pest Management Collaborative Research Support Program (IPM CRSP) to a consortium of institutions led by Virginia Tech as the management entity. The purpose of the program is to reduce crop losses, increase farmer income, reduce pesticide use, reduce pesticide residues on export products, improve IPM research and education capabilities, and increase the involvement of women in IPM decision making and program design in the host country sites and beyond. The primary host country sites initially included the Philippines, Guatemala, Mali, and Jamaica. The program is now entered into its second five-year phase and primary host country sites now include, in addition to the four original sites, Bangladesh, Ecuador, Uganda, and Albania.

The IPM CRSP work in Ecuador began in 1998. The CRSP uses a participatory approach to address pest management problems, one component of which is a participatory appraisal (PA) that helps those who will use the knowledge generated by the program to have a say in setting the research agenda. The PA is used to identify technical, institutional, economic, sociological, and informational constraints to IPM development and adoption. Information generated on the PA is combined with information gathered through a formal baseline survey to prioritize pest problems and to formulate research plans. The purpose of this report is to document the methods and results of both the PA and baseline survey implemented in Ecuador in from April to August 1998. Because the PA and survey were, of necessity, implemented and reported in Spanish, a brief summary is provided below in English followed by the complete report in Spanish.

Acknowledgements

Many people at the National Agricultural Research Institute (INIAP), The International Potato Center (CIP), and IPM CRSP scientists from Ohio State and Virginia Tech contributed to this study. We thank Oscar Ortiz and Sally Hamilton for commenting on the first draft. The assistance of Jose Unda, Jorge Grijalva, and Neidy Clavijo of the Technical Assistance and Training Unit of the INIAP Experiment Station at Santa Catalina is greatly appreciated. The Technology Validation and Transfer Unit at Carchi was instrumental in carrying out the information gathering necessary for this study. This paper is made possible through support provided by the U.S. Agency for International Development (USAID), under the terms of Grant No. LAG-4196-G-00-3053-00 made to Virginia Polytechnic Institute and State University (Virginia Tech) for the Integrated Pest Management Collaborative Research Support Program (IPM CRSP). The opinions expressed herein are the authors and do not necessarily reflect the views of USAID.

Summary

The Carchi area was chosen for the IPM CRSP potato activity because it is the most important potato area in Ecuador and 61% of the cultivated area in the region is planted to the crop. Potatoes are grown there with heavy pesticide use, particularly for control of late blight, (*Phytophera infestans*), Andean potato weevil (*Premnotrypes vorax*), and Guatemalan tuber moth (*Tecia solanívora*). Two of the principal institutions working on the IPM CRSP: INIAP, the primary national agricultural research system, and CIP, the International Potato Center, have active research programs there. The PA and baseline diagnostic survey were carried out by scientists and technicians from the INIAP Technology Validation and Transfer Unit of Carchi and the INIAP Department of Plant Protection at the Santa Catalina Experiment Station, south of Quito, in coordination with CIP. These activities were followed up with crop/pest monitoring to measure the degree of damage caused by the principal potato pests.

The complete Spanish version of the report which follows this summary is divided into ten sections. The first section provides a general description of the agro-ecological and sociological conditions of the Carchi region. The second describes the methods used in the study. The third provides results of the diagnostic survey with producers while the fourth summarizes results from interviews with representatives from non-governmental organizations and other institutions. The fifth section presents results fro interviews with extension agents and the sixth with pesticide dealers. The seventh section summarizes results of the PA, with special emphasis on problems associated with late blight, as the PA also contributed to a four-country (Ecuador, Bolivia, Peru, and Uganda) diagnostic study of late blight, with financial support from OPEC. The eighth section reports information from the monitoring work directed at Guatemalan tuber moth, while the ninth reports on monitoring results for Andean potato weevil. The tenth section provides discussion and conclusions.

1. General description of the Carchi Province

Carchi is located on the northern border of Ecuador and contains six political districts (cantones): Tulcan, Huaca, Montufar, Bolivar, Espejo, and Mira. Only 8% 0f its 3605 Km^2 has a slope of less than 6%. The temperature is relatively constant throughout the year with an average of around 12 degrees C. It freezes only occasionally. It rains all year, although rains are more frequent from October to May. The soils are deep and black with good water retention, slight acidity, and a high level of organic matter. The province has approximately 375,300 hectares, with about 34% in agriculture and most of the rest in forests and unproductive terrain.

The province is mostly rural, with 78% of its economically active (outside the household) population being male and 51% earning their living from agriculture. Only 8 percent report no schooling, although 64 % have only completed primary school. The principal social organization is the community and there are few farmer organizations. The farmers are very individualistic. Sixty-five percent of the farmers own less than 10 hectares, 20%

between 10 and 20 ha., 5% more than 20 ha., and 10% own no land. A number of governmental and non-governmental organizations work in the region.

2. Methods

Four Cantones were selected for the baseline survey: Tulcan, Huaca, Montufar, and Espejo. These localities were selected because of the importance of potatoes in the family diet and income, seriousness of pest problems based on previous surveys, differences in access to the market for pesticides, and representativeness of the region as a whole.One hundred farmers, 10 extension workers, 5 scientists, 14 pesticide dealers, and 10 representatives of other organizations were interviewed. Insect and disease severity was determined both by asking questions to farmers and others about pest severity during previous years, and by monitoring insect and disease incidence during the season (samples taken three times on each of 29 farms and 39 fields).

Management practices of the farmers were noted and information on the use of pesticides included type of product, dosage, cost, and method of application. In addition to structured questionnaires, participatory appraisal were used with groups of farmers. Representatives from other governmental and non-governmental organizations were asked the roles they play particularly with respect to pest management.

3. Results – Farm Diagnostics

Socioeconomic factors such as age, education, labor usage, land ownership, and farm size were noted. Farmers interviewed were predominately male with an average age of 50 and six years of schooling. Fifty-nine percent used additional family labor, and 76% owned fewer than 3 hectares. Most farmers plant a combination of other crops in addition to potatoes such as wheat, barley, corn, haba beans, peas, and forage.

Yields were measured in the field and ranged from 7000 to 30,000 kg/ha. Sixty-four percent of the producers reported yields between 10,000 and 20,000 kg/ha. Most farmers rotate crops, with forage or pasture being the most common crop in rotation with potatoes. A wide variety of potato varieties are planted and farmers replant the same seed for about five years, although most (72%) buy some new seed each year. About half the producers disinfect their seed each year before planting. The most common products used were Vitavax and Furadan. Details are provided in the Spanish report below on cultivation methods, planting density, fertilizer use and other practices.

Most of the farmers could identify the basic insect and disease problems affecting their potato crop, even if only in general terms. In addition to the three pests mentioned above, farmers mentioned the miner (*Lyriomiza sp*.) and a few others. However, late blight was the primary concern for 97% of the growers. Seventy-nine percent mentioned Andean potato weevil. Only 13% mentioned the tuber moth, although it is a relatively new pest in the region.

Farmers felt that late blight reduced their yields an average of 27%. Those that reported Andean weevil problems noted an average yield loss of 29% from that pest. Farmers know that late blight is a more severe problems during rainy periods and the weevil during dry periods. Others noted that lack of crop rotation made the weevil problem worse. Fifty-six percent reported using varieties with some resistance to late blight, especially Superchola. Few mentioned INIAP varieties. Few knew of viable alternatives to pesticides for controlling potato pests. Most felt that the more expensive the pesticde the better it was. Others felt that the products that were the most toxic to humans were likely to be the best for controlling plant pests. Several farmers indicated that they experiment with different mixtures of chemicals.

Fifty-eight percent of the farmers apply pesticides for late blight only when they see the symptoms. Nine percent follow a calendar-type spray schedule. Forty-six percent spray for Andean weevil prior to any symptoms. The average farmer sprayed six times for these two pests in 1998, 15 being the maximum number of sprays, despite spraying less than normal for late blight because it was a dry year. The fungicide Dithane was the most common pesticide used. The most common insecticide was Furadan. The cost of pesticides used per season varied from 23 Sucres per hectare to 466 Sucres per hectare, with an average of 205 Sucres.
The analysis of the incidence and severity of late blight during June July and August (relatively dry months) indicated an average incidence of 20% in 26 fields sampled three times each. Average severity was about five percent. These were fields that had already been sprayed. Farmers spent an average of 17% of their input costs on pesticides compared to 26% for fertilizers and 23% for harvest labor.

5. Results of Interviews With Institutional Representatives

The total number of extension workers in the Province of Carchi is only 25 people, only seven of whom are official extension workers for the Ministry of Agriculture and Livestock. The Ecuadorian Agricultural Health Service has another six extension workers, but these workers are not responsible for technology transfer but rather monitoring the health of products entering and leaving the country. There are four NGO's that could act as technology transfer agents, but little of their actively is directed at transferring pest management technologies. All the government and non-government agencies together do not reach more than 3000 people in the province, about 8% of the agricultural population and 2.5% of the total population. The only institution in Carchi with a significant program to actively transfer IPM technologies is the INIAP Validation and Technology Transfer Unit.

Interviews found that about 20% of the efforts of the various organizations that work with farmers are directed at pest management. All had heard of IPM. Representatives of these organizations felt that for IPM to spread, it will be important to foster farmer organizations, expand training in rational use of pesticides, have effective quarantine regulations, provide information on IPM, and increase technical assistance with repst to pest management. Inter-institutional cooperation is also important. Most of the institutions in the region use participatory approaches.

6. Results of Extension Worker Interviews

Of the 25 extension workers in Carchi, 9 are college-trained agronomists and 16 are agricultural technicians. These agents work with all three major potato pests. For Andean weevil, the extension workers have spread traps (50%) and pesticide advice (25%). For tuber moth, they helped farmers with phermones for storage and field use (62%) and chemical control (25%). For late blight, they helped with spreading use of resistant varieties (37%) and application of fungicides (37%). All them have received training in pest management. Sixty-two percent of them work on some activity related to IPM. They feel they need further training in new IPM technologies. Fifty percent of them have worked in projects that have required inter-institutional cooperation.

7. Results of Interviews With Pesticide Dealers

Only 21 percent of establishments that sell pesticides are run by people that have professional agronomic training. These establishments vary greatly in how important pesticides are as a proportion of their business. They provided information on the most commonly used pesticides. They reported they all farmers request advice on use of the pesticides (recommended products and dosage). They said that farmers often ask if they can mix pesticides and if they cab apply at higher dosages than normal. Fifty percent of the dealers say they recommend mixing two or three pesticides for controlling late blight and suggest applying fungicides every 15 days during dry weather and every 6-8 days during rainy weather. The other 50% suggests using systemic products alone during rainy times with symptoms and protectants when there are no problems.

Pesticide dealers said that about 28% of farmers request refunds because the products do not work adequately. All venders have received some training in pesticide use. All use some protective clothing.

7. Results of the Participatory Appraisal on Late Blight

The PA in Carchi focused on group discussions with four groups of respondents in three cantones. Each group consisted of 10-16 people, and these groups were then broken down into sub-groups of 4-6 people for discussion. Four facilitators led the discussions with each group and they were asked to center the discussions around four basic pest management issues or questions. The first question was whether they could recognize late blight and where it comes from. All they respondents to the questions could recognize the disease and its symptoms. However, they had a wide range of responses to where it comes from.

They were asked what they do to control the problem and which products they apply. Most indicated they apply fungicides every 7-8 days during the rainy time and every 15 days in drier periods. They mix products stronger during rainy times. They almost always use mixtures rather than single chemicals.

They were asked what a fungicide is and how they obtain it. There was wide variation in knowledge about what a fungicide is and how it works. Most obtain fungicides from commercial stores, especially those that extend credit. They could identify varieties that were more susceptible to late blight than others.

They were asked where they learned about methods for controlling late blight. Most said they learned from their parents and neighbors. They do not have great confidence in the advice of pesticide salesmen, but nonetheless often follow their advice. Occasionally they receive information from institutions such as INIAP.

8. Monitoring, Adaptation, and Validation of Technologies for Tuber Moth

The Guatemalan Tuber Moth (*Tecia Solanivora*) entered Carchi in 1996 from Colombia, where damages of 50% in storage were being realized. In order to understand the dynamics of the expansion of the pest, the Technology Transfer and Validation Unit of INIAP in Carchi monitored the pest with pheromone traps from September 1997 to October 1998 in 43 localities. The severity of infestation was very diverse and it appears that the mechanism of spread is its own migratory activity. There was an inverse correlation of pest severity with altitude.
Several experiments with a variety of pest management controls were completed in a related set of studies in the area. It was found that Carbaryl 10% gave the best control compared to other pesticides or to IPM controls such as eucalyptus leaves.

9. Adaptation and Validation for Andean Potato Weevil

IPM technologies were compared with farmers' practice for control of Andean potato weevil (*Premnotrypes vorax*). The IPM technologies consisted of eliminating adults through traps before and after planting followed by limited applications of insecticide. The farmers' practice was extensive use of pesticides. Damage estimates were not significantly different, but net cost was significantly less with IPM. Details of the specific technologies are reported in the paper below.

10. Discussion and Conclusions

Potatoes are the primary crop for most farmers in the region and much of the crop is for home consumption. The farmers are more concerned about production than the environment. Many farmers apply pesticides when they first see symptoms or increased pest density. The principal pests causing yield loss are late blight and Andean potato weevil. Heavy pesticide users did not experience less pest damage than those that used fewer pesticides. Few farmers seemed very concerned about the health effects of pesticide use. In the region, very few institutions are helping potato farmers with pest management. Extension personnel are also limited. Resources are limited for the existing institutions. IPM training for farmers is greatly needed. There is an urgent need to extend existing technologies as well as to produce and extend more effective and economically viable technologies.